

RESEARCH

Is German discourse-configurational? Experimental evidence for a topic position

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Frey (2000; 2004) assumes that German is discourse-configurational regarding aboutness topics, namely that there is a special syntactic position for topics within the German middle field, directly above the base position of sentence adverbials. In this paper we will present two acceptability judgment studies and two reading time studies that provide support for a designated topic position in German. Based on assumptions regarding (non-)topicable noun phrases, i.e. phrases that are (not) able to serve as an aboutness topic (see e.g. Frey 2004; Endriss 2009), we manipulated the subject type (referential, quantified, non-referential) and the position of the subject (preceding and following a sentence adverbial). In a further experiment, we varied whether the referential subject is marked as a topic or not. In sum, we found convincing evidence for a syntactic topic position. We do not think that our results affirm the assumption of a TopP (topic phrase), but they at least suggest the existence of a topic position in a descriptive sense.

Keywords: sentence processing; aboutness topic; topic position; sentence adverbial; information structure

1 Introduction

In languages like German with a relatively free word order, there seems to be a strong relation between information structure and word order. For quite a while it has been considered that topicality as an information-structural dimension impacts the syntactic position of constituents. The assumption is that (a) certain position(s) can or must host topical constituents.

- (1) a. Otto liest immer Bücher über Wombats.
Otto reads always books about wombats
'Otto always reads books about wombats.'
- b. Otto, er liest immer Bücher über Wombats.
Otto he reads always books about wombats
'Otto, he always reads books about wombats.'

In contrast to the common view that the only syntactic position in which topics occur is sentence initial (see example (1); e.g. Gundel 1988; Molnár 1991), researchers meanwhile assume that topics do not necessarily have to appear on the left periphery (see Reinhart 1981; Jacobs 1984; 2001; Vallduví 1990; Lambrecht 1994; Meinunger 1996; Vallduví & Engdahl 1996; Frey & Pittner 1998; Frey 2000; 2003; 2004; Endriss 2009) – although there is a strong preference for this position. Nevertheless, some authors claim that German is discourse-configurational concerning topics (e.g. Jacobs 1986; Frey 2000; 2004), but that the designated topic position is located in the middle field and not in the

prefield. E.g. Frey (2000; 2004) assumes that every topical constituent has to occupy this topic position, which is located directly above the base position of sentence adverbials. Only from this position can it move further to the prefield.

Sentence adverbials are adverbials like *wahrscheinlich* ('probably'), *anscheinend* ('apparently') and *erfreulicherweise* ('fortunately'). They are speaker-oriented adverbs that modify the whole proposition, which makes the assumption that they appear high up in the tree quite plausible from a compositional point of view. Authors like Frey & Pittner (1998) and Frey (2003) assume that they are located above all other arguments and adverbials.

It has long been noted that the positioning of adverbials is sensitive to information structural factors. They are often taken to be indicators of information structural boundaries. Diesing (1992) and Kratzer (1995) for example have developed the so-called Mapping Hypothesis concerning the relation between the interpretation of a phrase and its syntactic position. While in a sentence like (2a), the indefinite DP *Bücher über Wombats* ('books about wombats') following the adverbial *immer* ('always') gets a weak or existential reading, it receives a strong or generic reading in the position preceding the adverbial in (2b) (Diesing 1992: 107–108). The boundary marked by the adverbial is identified with the VP boundary: Material from the VP is mapped into the nuclear scope whereas material from the IP is mapped into a restrictive clause.¹

- (2) a. ...dass Otto **immer Bücher über Wombats** liest
 ...that Otto always books about wombats reads
 '...that Otto is always engaged in reading books about wombats'
- b. ...dass Otto **Bücher über Wombats immer** liest
 ...that Otto books about wombats always reads
 '...that Otto never leaves a book about wombats unread'

A definite DP like *das Buch über Wombats* ('the book about wombats') gets a strong interpretation in both positions. However, Meinunger (1996; 2000) points out that there is still an interpretational difference: This definite DP can only be the sentence topic if it appears to the left of the adverbial. Meinunger assumes that in this case it contains a feature [+topic] and it obligatorily moves from the VP to the specifier position of an agreement phrase, where this feature is checked. On this view, adverbials mark the boundary between topic(s) in the agreement phrase and the rest of the sentence, namely the VP, which hosts the comment. According to Meinunger, it is adverbials in general that mark this boundary.

A similar view on the boundary between the VP and the syntactically higher part of the sentence can be found in Haftka (1988; 2003). She assumes that the boundary between given and new information is marked by adverbials, but, in contrast to Meinunger, she attributes this boundary function only to sentence adverbials. In her view, different adverbials have different syntactic base positions. Sentence adverbials are assumed to have their base position high up in the tree, above all other arguments and adverbial classes. Anything located above sentence adverbials does not belong to or has moved out of the VP. Haftka assumes a syntactic structure with several functional phrases above the VP and the sentence adverbials which carry certain information structural features. In her account, topicality is hosted in a designated functional projection and thus is introduced as a syntactic feature (see Rizzi 1997 for a similar assumption).

¹ Note that Diesing (1992: 107–108) actually states that this boundary is marked by sentence adverbials. Nevertheless, in the original example in (2), she uses a frequency adverbial.

As mentioned above, in Frey's (2000; 2004) view sentence adverbials mark the boundary between aboutness topic and comment. He also assumes that German is discourse-configurational regarding topics, i.e. that there is a special syntactic position for aboutness topics in the German middle field, directly above the base position of sentence adverbials. A constituent that is an aboutness topic has to appear in this position (before moving to the prefield if necessary); and a constituent that is placed in this position has to be an aboutness topic. More specifically, Frey assumes a functional topic phrase TopP.

In the example in (3) (Frey 2004: 158), *Maria* is marked as an aboutness topic by the preceding sentence. The continuation in (3a) with the subject *Maria* preceding the sentence adverbial *wahrscheinlich* ('probably') is fine, whereas the continuation in (3b), with the subject following the sentence adverbial, is not acceptable or at least highly marked. According to Frey, this is evidence for the claim that if a constituent is marked as topic, it can only appear in a position above the sentence adverbial: the topic position.

- (3) Ich erzähle dir etwas über Maria. –
 'I tell you something about Maria.'
- a. Nächstes Jahr wird **Maria wahrscheinlich** nach London gehen.
 next year will Maria probably to London go
 'Next year, Maria will probably go to London.'
- b. #Nächstes Jahr wird **wahrscheinlich Maria** nach London gehen.
 next year will probably Maria to London go
 'Next year, Maria will probably go to London.'

Movement into the topic position is assumed as movement for information structural reasons into a position with specific information structural features (cf. Meinunger 1996; 2000).² Our assumption, following Frey, is that movement into a topic position and scrambling are different types of movement operations, compare the example in (4) (Frey 2004: 169). The direct object *den Paul* ('the.ACC Paul') in the second sentence in (4) has scrambled into a position higher than the subject *eine vornehme Dame* ('a fine lady'). However, this movement is not compatible with the given context, which makes *den Paul* ('the.ACC Paul') the aboutness topic. Thus scrambling does not fulfill the information structural demand here, since the aboutness topic is not in the designated syntactic topic position.

- (4) Ich erzähle dir etwas über Paul. –
 'I tell you something about Paul.'
- #Bald wird **erfreulicherweise** [den Paul]_i eine vornehme Dame t_i heiraten.
 soon will fortunately the.ACC Paul a fine lady t_i marry
 'Fortunately, a fine lady will soon marry Paul.'

Another piece of evidence pointing to the difference between scrambling and topic movement is given in (5). There are constituents that do not scramble, but can undergo topic movement. (5a) shows that the genitive *dieses Anschlages* ('this.GEN attack') has to be adjacent to the verb if it stays in the VP, i.e. it cannot scramble across the direct object *einen Unschuldigen* ('an innocent'). But the genitive is able to move across the sentence adverbial AND thereby also across the direct object, as in (5b). That means it can undergo topic movement, but not scrambling (Frey 2000: 161).

² Note that Meinunger uses the term "scrambling" for this kind of movement; he does not differentiate between scrambling and topic movement.

- (5) a. *weil Hans **bedauerlicherweise** [dieses Anschlages]_i einen Unschuldigen
because Hans unfortunately this.GEN attack an innocent
t_i bezichtigte
t_i accused
'because unfortunately Hans accused an innocent of this attack'
- b. weil Hans [dieses Anschlages]_i **bedauerlicherweise** einen Unschuldigen
because Hans this.GEN attack unfortunately an innocent
t_i bezichtigte
t_i accused
'because unfortunately Hans accused an innocent of this attack'

This leads to the conclusion that topic movement and scrambling are two different types of movement operations.

In contrast, other authors reject the assumption of a syntactic topic position in German. E.g. Fanselow (2006) and Fanselow & Lenertová (2011) claim that syntax does not contain any information structural mechanisms. Rather, if word order seems to reflect information structure, it is mediated by phonology; thus information structure has only an indirect relation to syntax.

Fanselow (2006) reports an acceptability judgment experiment concerning the question of a topic position in the German upper middle field. He tested sentences containing two cataphoric pronouns, which can only be interpreted as co-referent with a topic of a following clause (see Reinhart 1981; 1995; Frey 2004), cf. (6). In this following clause, the position above a sentence adverbial like *überraschenderweise* ('surprisingly'), i.e. in the topic position under discussion, was occupied by both subject and object DP (see (6a)), or just the subject DP (see (6b)), or neither DP (see (6c)). In an additional control condition, cf. (6d), co-reference of pronoun and object DP was not possible due to a gender mismatch.

- (6) Obwohl er sie liebt, ...
'Although he loves her ...'
- a. hat gestern **der Hans** seine Freundin **überraschenderweise** verlassen.
has yesterday the Hans his girlfriend surprisingly left
'...Hans surprisingly left his girlfriend yesterday.'
- b. hat gestern **der Hans überraschenderweise** seine Freundin verlassen.
has yesterday the Hans surprisingly his girlfriend left
'...Hans surprisingly left his girlfriend yesterday.'
- c. hat gestern **überraschenderweise der Hans** seine Freundin verlassen.
has yesterday surprisingly the Hans his girlfriend left
'...Hans surprisingly left his girlfriend yesterday.'
- Obwohl er ihn liebt, ...
'Although he loves him ...'
- d. hat gestern **überraschenderweise der Hans** seine Freundin verlassen.
has yesterday surprisingly the Hans his girlfriend left
'...Hans surprisingly left his girlfriend yesterday.'

The results show that the syntactic violation condition (6d) was judged as significantly less acceptable than (6c), which Fanselow interprets as evidence against a syntactic TopP. Nevertheless, there was also a significant difference in judgments between sentences with no element in the topic position and the conditions with one or two DPs preceding the sentence adverbial.

In our view, it is not surprising that an information structural violation leads to smaller judgment difference than a gender mismatch since the syntactic positions in which the subject and object DPs were located are permissible syntactic positions. But still, a significant difference

was found for (6c) compared to (6a) and (6b). This result can be interpreted as evidence for a topic position, at least in a descriptive sense. Therefore, we will use the term *syntactic topic position* in this weaker sense and argue that our data are evidence for a descriptive topic position above sentence adverbials, but cannot be seen as evidence for a functional TopP.

Before turning to our studies, we will have a closer look at several requirements for topichood. A widely accepted precondition for topichood is referentiality (see e.g. Reinhart 1981; Molnár 1991; Jacobs 2001), which suggests that non-referential phrases should not be possible topics. This should become clear if we look at common definitions of aboutness topics like (7) or (8), based on Reinhart's (1981) notion of aboutness:

- (7) "The topic constituent identifies the entity or set of entities under which the information expressed in the comment constituent should be stored in the CG [= common ground, M.S. & B.S.] content." (Krifka 2008: 265)
- (8) "A referent is interpreted as the topic of a proposition if in a given situation the proposition is construed as being about this referent, i.e. as expressing information which is relevant to and which increases the addressee's knowledge of this information." (Lambrecht 1994: 131)

It would be difficult to imagine giving information about a non-specific, non-identifiable and therefore non-referential entity. Thus, we assume referentiality as a prerequisite for being a topic.

In a strict sense, only proper names and definites count as referential phrases. Indefinite phrases have been assumed to be ambiguous between a referential (or specific) and a quantificational (or existential/non-specific) interpretation (e.g. Fodor & Sag 1982). Therefore, they cannot be labelled as referential per se (see Endriss 2009: 23–24). Taking a look at the examples in (9) to (11) (examples are parallel to Frey 2000: 141), it is conspicuous that a subject like *der Student* ('the student') in (9) is a good candidate for a topic, because it is definite and therefore referential in a narrow sense, so it has prototypical topic properties.

A numerically quantified phrase like *zwei Studenten* ('two students') in (10)³ is not a proper name and not definite, so, following Endriss, it is not referential in the narrow sense. This is because "[i]n fact, quantifiers do not refer back to already introduced referents. They introduce new discourse referents themselves [...]" (Endriss 2009: 29). So they intuitively do not serve as good addresses for storing new information. Nevertheless, Endriss considers numerically quantified phrases as possible topics as well, and Frey (2000: 147–148) also states that an indefinite phrase like *zwei Studenten* ('two students') is a possible topic. That means that the (non-)topicability of numerals is less clear. They seem to be able to serve as topics, but are not prototypical ones.

By contrast, a non-referential subject like *kein Student* ('no student') in (11) cannot be a topic. Establishing a mental address is not possible in this case, since a non-referential phrase neither points to a concrete referent nor does it refer back to an already introduced one, as would be needed for an aboutness relation (Reinhart 1981). Therefore, a sentence pair like (11) is not acceptable.⁴

- (9) Ich erzähle dir etwas über den Studenten. –
'I tell you something about the student.'
Während des Vortrags hat **der Student anscheinend** geschlafen.
during the talk has the student apparently slept
'During the talk, {the student} apparently slept.'

³ We are aware of the fact that question and answer do not fit perfectly here, but the aim was to construe all three examples in parallel.

⁴ The role negation scoping over a modal might play here will be considered in the discussion section of Experiment 1.

- (10) ?Ich erzähle dir etwas über zwei Studenten. –
‘I tell you something about two students.’
Während des Vortrags haben **zwei Studenten anscheinend** geschlafen.
during the talk have two students apparently slept
‘During the talk, {two students} apparently slept.’
- (11) ??Ich erzähle dir etwas über keinen Studenten. –
‘I tell you something about no student.’
*Während des Vortrags hat **kein Student anscheinend** geschlafen.
during the talk has no student apparently slept
‘During the talk, {no student} apparently slept.’

Given these observations and assumptions regarding topics and their syntactic position(s), we will now turn to psycholinguistic data. Stolterfoht, Frazier & Clifton (2007) found experimental evidence for a topic position preceding sentence adverbials in English. Even though English is a language with a relatively fixed word order which, in contrast to German, does not allow scrambling, the data suggest that topic movement is possible.

Stolterfoht, Frazier & Clifton looked at referential and non-referential subjects above and below sentence adverbials in English. With a self-paced reading task, they investigated sentences like (12) and found significantly longer reading times for the embedded clause in (12d), with a non-referential subject preceding the sentence adverbial, compared to the other three sentence types, which they interpret as evidence for a topic position in English.

- (12) a. The father stated that **certainly the son** washed the car.
b. The father stated that **the son certainly** washed the car.
c. The father stated that **certainly no son** washed the car.
d. The father stated that **no son certainly** washed the car.

Starting from the results on processing English, we conducted four experiments testing the assumption of a topic position within the German middle field. Experiment 1 (acceptability judgments) used the German translations of the English materials from Stolterfoht, Frazier & Clifton (2007). In addition to the referential and non-referential conditions, we included a further condition with numerically quantified – thus referential, but not definite – subjects to see whether these phrases are acceptable if moved to the assumed topic position. Experiment 2 (acceptability judgments) and Experiment 3 (reading times) then looked at a further type of subject DP, namely universally quantified phrases. These experiments further allowed a comparison of online and offline data, which showed discrepancies with regard to adverbial position in earlier studies (see Störzer & Stolterfoht 2013). In Experiment 4 (reading times), we used contextual topic marking to distinguish between referentiality and topicality as relevant factors.

2 Experiments

2.1 Experiment 1: Rating study

Experiment 1 used an acceptability judgment task.

As illustrated in (13), the sentence materials manipulated two factors: SUBJECT TYPE (definite and referential *der Junge* ‘the boy’ vs. numerically quantified and therefore possibly referential *zwei Jungen* ‘two boys’ vs. indefinite and negated and therefore non-referential *kein Junge* ‘no boy’); and POSITION of the subject in relation to a sentence adverbial (preceding or following the sentence adverbial), resulting in six different conditions.

- (13) a. Der Nachbar erwähnte, dass **vielleicht der Junge** das Auto gewaschen hat.
the neighbor mentioned that maybe the boy the car washed has
‘The neighbor mentioned that maybe the boy washed the car.’

- b. Der Nachbar erwähnte, dass **der Junge vielleicht** das Auto gewaschen hat.
the neighbor mentioned that the boy maybe the car washed has
'The neighbor mentioned that maybe the boy washed the car.'
- c. Der Nachbar erwähnte, dass **vielleicht zwei Jungen** das Auto gewaschen haben.
the neighbor mentioned that maybe two boys the car washed have
'The neighbor mentioned that maybe two boys washed the car.'
- d. Der Nachbar erwähnte, dass **zwei Jungen vielleicht** das Auto gewaschen haben.
the neighbor mentioned that two boys maybe the car washed have
'The neighbor mentioned that maybe two boys washed the car.'
- e. Der Nachbar erwähnte, dass **vielleicht kein Junge** das Auto gewaschen hat.
the neighbor mentioned that maybe no boy the car washed has
'The neighbor mentioned that maybe no boy washed the car.'
- f. Der Nachbar erwähnte, dass **kein Junge vielleicht** das Auto gewaschen hat.
the neighbor mentioned that no boy maybe the car washed has
'The neighbor mentioned that maybe no boy washed the car.'

Hypothesis 1-1: Topic position

If German does have a syntactic position for topics above sentence adverbials, we expect an interaction of the two manipulated factors SUBJECT TYPE and POSITION.

- Non-referential subjects like *kein Junge* ('no boy') should not be able to appear above sentence adverbials, since they are not suitable aboutness topics. Hence, they should be judged better in the position below sentence adverbials.
- Numerically quantified subjects like *zwei Jungen* ('two boys') which are not definite, but referential should be possible topics, although not necessarily preferred. So for them, two different predictions can be derived: a) Since they are not prototypical topics, it is possible that they behave like non-referential DPs like *kein Junge* ('no boy') and thus are judged better below sentence adverbials. b) For the reason that they are – following Endriss (2009) or Frey (2000) – nevertheless possible topics, it is also possible that they are judged as good above as below a sentence adverbial.
- For subjects like *der Junge* ('the boy'), we predict that they are preferred topics because they are definite as well as referential and therefore exhibit prototypical topical properties. So we expect better judgments in the position above sentence adverbials than in the position below.

Hypothesis 1-2: No topic position

In case German does not have a syntactic position for topics, there should be no difference in judgments with regard to the referential status of the subject. Therefore, no interaction of the two factors SUBJECT TYPE and POSITION is expected.

2.1.1 Method

2.1.1.1 Participants

48 undergraduate students of the University of Tübingen were paid for participation. All were native speakers of German.

2.1.1.2 Materials

Sentence materials consisted of 24 experimental items and 48 filler items. Each experimental item was prepared in six versions which differed with respect to the subject type (definite vs. numerical vs. non-referential) and the position of the subject (Su) relative to the sentence adverbial (SA) (SA-Su vs. Su-SA). As sentence adverbials we used evidential

adverbials like *offensichtlich* ('obviously') as well as epistemic adverbials like *vielleicht* ('maybe') and evaluative adverbials like *leider* ('unfortunately'). Each class was used eight times. Since we used each sentence adverbial only once, we had 24 lexically different adverbials.

Filler sentences originated from two other studies. The first ones varied the realization of verbal passive vs. adjectival passive. The second ones aimed to investigate coercion processes in semantic inappropriate verb and argument combinations.

2.1.1.3 Design and procedure

We employed a 3 (SUBJECT TYPE: definite vs. numerical vs. non-referential) × 2 (POSITION: SA-Su vs. Su-SA) design, with both factors being manipulated within participants and within items. Six presentation lists were constructed in which the 24 experimental items were randomly mixed with the 48 filler sentences. The six lists were counterbalanced across items and conditions: Each list included only one version of each experimental item. To control for possible order effects, the six lists were also presented in inverted order.

Participants received questionnaires via e-mail. They were asked to judge the acceptability of the sentences on a scale from 5 ("highly acceptable") to 1 ("not acceptable").

2.1.1.4 Data analysis

Participants' ratings were analyzed with two separate ANOVAs, one with an error term that was based on participant variability (*F1*) and one with an error term that was based on item variability (*F2*). The independent variables were SUBJECT TYPE (definite, numerical, or non-referential) and POSITION (SA-Su or Su-SA). The ANOVAs were 3 × 2 with repeated measurement in both the participant and the item analysis.

2.1.2 Results

The results are presented in Table 1 and Figure 1.

Table 1: Mean acceptability judgments for the six conditions on a 5-point-scale; standard deviation based on *F1* variability.

	referential	numerical	non-referential
SA-Su	3.224 (<i>SD</i> = .708)	3.495 (<i>SD</i> = .845)	3.286 (<i>SD</i> = .777)
Su-SA	3.583 (<i>SD</i> = .735)	3.396 (<i>SD</i> = .795)	2.505 (<i>SD</i> = .888)

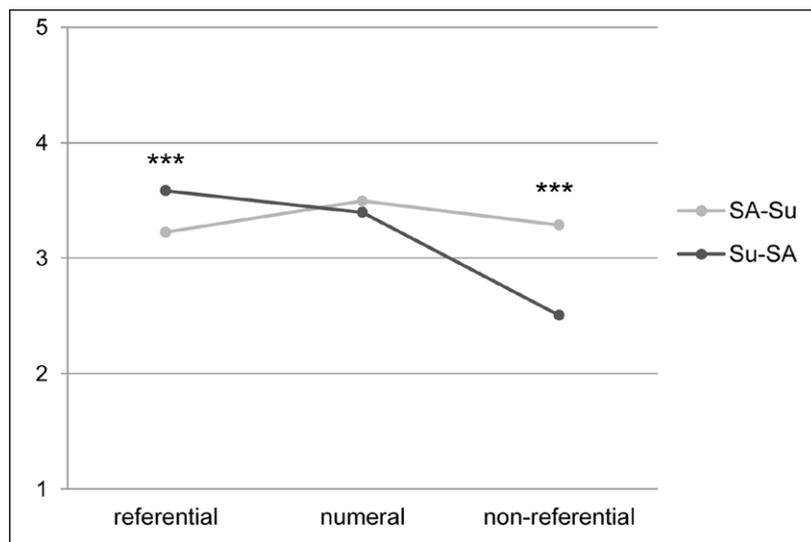


Figure 1: Mean acceptability judgments for the six conditions on a 5-point-scale.⁵

⁵ Asterisks in Figure 1 and in the following figures represent p-values. * corresponds to $p \leq .05$; ** to $p \leq .01$; *** to $p \leq .001$.

We found significant main effects of SUBJECT TYPE ($F1(2,94) = 24.948, p_1 < .001; F2(2,46) = 20.009, p_2 < .001$) and POSITION ($F1(1,47) = 7.652, p_1 < .01; F2(1,23) = 7.166, p_2 < .05$).⁶ More importantly, there was a highly significant interaction of the two factors SUBJECT TYPE and POSITION ($F1(2,94) = 26.621, p_1 < .001; F2(2,46) = 24.248, p_2 < .001$). Planned comparisons showed that sentences containing a definite referential subject like *der Junge* ('the boy') were judged significantly better with the subject preceding the sentence adverbial ($F1(1,47) = 28.810, p_1 < .001; F2(1,23) = 12.179, p_2 < .01$). By contrast, with numerically quantified subjects like *zwei Jungen* ('two boys') there were no differences in judgments for the two positions ($F1(1,47) = .722, p_1 = .400; F2(1,23) = .629, p_2 = .436$). If the subject was negated and non-referential (*kein Junge* 'no boy'), mean ratings revealed a clear preference for the position below sentence adverbials ($F1(1,47) = 41.007, p_1 < .001; F2(1,23) = 31.409, p_2 < .001$).

2.1.3 Discussion of Experiment 1

In Experiment 1 as well as in the following experiments, the data revealed a main effect of SUBJECT TYPE, with higher ratings and shorter reading times for referential than for non-referential conditions, suggesting that non-referential DPs lead to processing effort. Since it is not relevant for our research question, we will not further discuss this effect. Furthermore, we found a significant main effect of the factor POSITION in favor of the subject's position below the sentence adverbial, which we interpret as evidence for the assumption that the base position of the highest ranked argument (= the subject) is below a sentence adverbial (compare e.g. Frey 2004); therefore the position above the sentence adverbial is a derived position. Since it has been shown in several studies that movement causes processing difficulties (for an overview, see e.g. Bader et al. 2000), we conclude that this is the reason for an overall lower acceptability for this position.

In addition, there was a significant interaction of the two factors SUBJECT TYPE and POSITION, indicating that the referential status of the subject influences its preferred position in relation to a sentence adverbial. Definite referential subjects like *der Junge* ('the boy'), which are assumed to be prototypical topics, are judged significantly better when they precede the sentence adverbial than when they follow it. Numerically quantified subjects like *zwei Jungen* ('two boys'), which can be topics, but are not prototypical ones, showed no significant difference for the two positions. For negated non-referential subjects like *kein Junge* ('no boy'), the position below sentence adverbials is clearly preferred.

These results support Hypothesis 1-1 and can be interpreted as evidence for the assumption that there is a topic position above sentence adverbials in German.

But there is an alternative explanation of the effect found for the negated non-referential phrases. It has been observed that (modal) sentence adverbials cannot appear in the scope of clause internal negation (see e.g. Bellert 1977: 346; Lang 1979: 207; Piñón 2006: 1). This observation is illustrated by the non-referential condition of one of our experimental items ((13f), repeated as (14a)).

- (14) a. *Der Nachbar erwähnte, dass **kein Junge vielleicht** das Auto gewaschen hat.
the neighbor mentioned that no boy maybe the car washed has
*'The neighbor mentioned that no boy maybe washed the car.'
- b. ?Der Nachbar erwähnte, dass **jeder Junge vielleicht** das Auto gewaschen hat.
the neighbor mentioned that every boy maybe the car washed has
'The neighbor mentioned that every boy maybe washed the car.'

⁶ Since we only predict an interaction and a specific pattern for single comparisons, we will not discuss the main effects in more detail.

If this observation is right and negated phrases cannot scope over sentence adverbials, it would follow that a negated phrase cannot appear above sentence adverbials. Therefore negated phrases are not a suitable test case for the assumed topic position, and thus the results do not tell us anything about the existence of a topic position. Additionally, this alternative explanation would also explain the longer reading times for negated subjects preceding sentence adverbials in English, as reported by Stolterfoht, Frazier & Clifton (2007), who also used negated non-referential phrases.

To exclude this alternative explanation of the results for the non-referential conditions, we replaced negated non-referential subjects like *kein Junge* ('no boy') with quantified non-referential subjects like *jeder Junge* ('every boy'). As shown in example (14b), sentence adverbials can appear in the scope of a universal quantifier, but universally quantified phrases should again be bad candidates for topics. Even Endriss (2009), who is quite liberal with regard to allowing quantifiers to be potential topics, chooses not to include them in her candidate list.

2.2 Experiment 2: Rating study

Sentence materials were similar to the ones used in Experiment 1, but instead of six conditions, materials in this experiment only contained four conditions.⁷ We again used definite referential subjects like *der Junge* ('the boy'). For the non-referential subjects, we replaced negated DPs by universally quantified DPs like *jeder Junge* ('every boy').

The two manipulated factors again were SUBJECT TYPE and the POSITION of the subject in relation to the sentence adverbial, see (15).

- (15)
- a. Der Nachbar erwähnt, dass **tatsächlich der Junge** das Auto gewaschen hat.
the neighbor mentions that actually the boy the car washed has
'The neighbor mentions that actually the boy washed the car.'
 - b. Der Nachbar erwähnt, dass **der Junge tatsächlich** das Auto gewaschen hat.
the neighbor mentions that the boy actually the car washed has
'The neighbor mentions that actually the boy washed the car.'
 - c. Der Nachbar erwähnt, dass **tatsächlich jeder Junge** das Auto gewaschen hat.
the neighbor mentions that actually every boy the car washed has
'The neighbor mentions that actually every boy washed the car.'
 - d. Der Nachbar erwähnt, dass **jeder Junge tatsächlich** das Auto gewaschen hat.
the neighbor mentions that every boy actually the car washed has
'The neighbor mentions that actually every boy washed the car.'

The following hypotheses can be derived:

Hypothesis 2-1: Topic position

If German does have a syntactic position for topics above sentence adverbials, we expect an interaction of the two manipulated factors SUBJECT TYPE and POSITION.

- Universally quantified non-referential subjects like *jeder Junge* ('every boy') should not be able to appear above sentence adverbials, since they are not suitable aboutness topics. Hence, they should be judged better in the position below sentence adverbials.
- As already shown in Experiment 1, subjects like *der Junge* ('the boy'), which are definite and referential and therefore prototypical topics, should be preferred in the position above sentence adverbials. Therefore, we expect better judgments for this position.

⁷ Since the results of Experiment 1 already showed that numerically quantified phrases like *zwei Jungen* ('two boys') do not lead to any position-dependent effect, we did not include this subject type in following experiments.

Hypothesis 2-2: No topic position

If German does not have a syntactic topic position and effects for non-referential subjects of Experiment 1 were due to the fact that sentence adverbials cannot appear in the scope of negation, then we expect no interaction of the two factors SUBJECT TYPE and POSITION. Thus, quantified non-referential phrases like *jeder Junge* ('every boy') should behave differently than negated non-referential phrases like *kein Junge* ('no boy') in the previous experiment.

2.2.1 Method

2.2.1.1 Participants

48 undergraduate students of the University of Tübingen were paid for participation. All were native speakers of German.

2.2.1.2 Materials

Sentence materials consisted of 24 experimental items and 152 filler items. Each experimental item was prepared in four versions that differed with respect to the subject type (definite referential vs. universally quantified non-referential) and the position of the subject (Su) relative to the sentence adverbial (SA) (SA-Su vs. Su-SA). In contrast to Experiment 1, we used only epistemic and evidential adverbials, since it was observed in another study that evaluative adverbials behave differently than the other two adverbial classes (cf. Störzer 2013). We used four different epistemic adverbials (*wahrscheinlich* 'probably', *möglicherweise* 'possibly', *vermutlich* 'presumably', *sicherlich* 'certainly') and four different evidential adverbials (*anscheinend* 'apparently', *angeblich* 'allegedly', *offenbar* 'obviously', *tatsächlich* 'actually') and repeated each adverbial three times.

Filler sentences originated from several other studies. They all were constructed as matrix sentences containing embedded sentences in which the position of different adverbials (manner adverbials, frame adverbials, temporal adverbials or ambiguous manner adverbials) in relation to arguments was varied.

2.2.1.3 Design and procedure

We employed a 2 (SUBJECT TYPE: definite referential vs. universally quantified non-referential) \times 2 (POSITION: SA-Su vs. Su-SA) design, with both factors being manipulated within participants and within items. Four presentation lists were constructed in which the 24 experimental items were randomly mixed with the 152 filler sentences. The four lists were counterbalanced across items and conditions: Each list included only one version of each experimental item.

The experiment was run on a PC using E-Prime 2.0 software (Psychology Software Tools, Inc.). Participants were asked to read sentences and then judge their acceptability on a scale from 5 ("highly acceptable") to 1 ("not acceptable").

2.2.1.4 Data analysis

Participants' ratings were analyzed with two separate ANOVAs, one with an error term that was based on participant variability (F_1) and one with an error term that was based on item variability (F_2). The independent variables were SUBJECT TYPE (definite referential vs. universally quantified non-referential) and POSITION (SA-Su vs. Su-SA). The ANOVAs were 2 \times 2 with repeated measurement in both the participant and the item analysis.

2.2.2 Results

Table 2 and Figure 2 show the results.

The results revealed main effects of SUBJECT TYPE (F_1 (1,47) = 94.279, $p_1 < .001$; F_2 (1,23) = 88.467, $p_2 < .001$) and POSITION (F_1 (1,47) = 4.146, $p_1 < .05$; F_2 (1,23) = 5.223, $p_2 < .05$). In addition, there was a highly significant interaction of the two

Table 2: Mean acceptability judgments for the four conditions on a 5-point-scale; standard deviation based on F1 variability.

	referential	non-referential
SA-Su	4.177 (SD = .685)	3.465 (SD = .866)
Su-SA	4.406 (SD = .728)	2.951 (SD = .926)

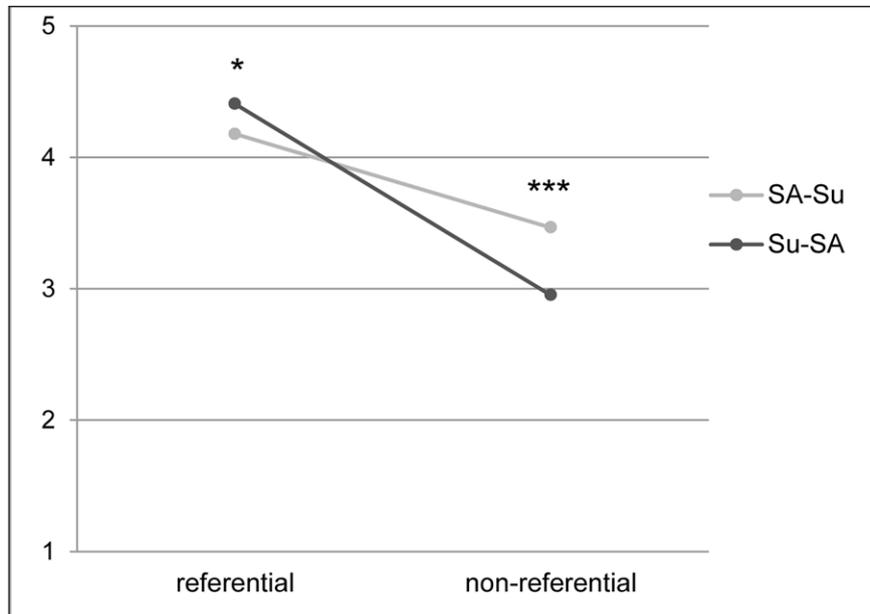


Figure 2: Mean acceptability judgments for the four conditions on a 5-point-scale.

factors SUBJECT TYPE and POSITION ($F_1(1,47) = 31.536, p_1 < .001; F_2(1,23) = 26.862, p_2 < .001$). Planned comparisons showed that sentences with definite referential subjects were judged better in the position above the sentence adverbial ($F_1(1,47) = 5.914, p_1 < .05; F_2(1,23) = 4.535, p_2 < .05$) whereas sentences with quantified non-referential subjects were judged better in the position below the sentence adverbial ($F_1(1,47) = 27.368, p_1 < .001; F_2(1,23) = 40.892, p_2 < .001$).

2.2.3 Discussion of Experiment 2

The results of Experiment 2 show a rather similar pattern as our first rating study. The main effect of the factor POSITION can again be interpreted as an effect which is due to the subject’s base position below the sentence adverbial. Furthermore, the highly significant interaction of the factors SUBJECT TYPE and POSITION again indicates that the referential status of the subject influences its preferred position in relation to a sentence adverbial. Definite referential subjects are preferred above sentence adverbials whereas quantified non-referential subjects are preferred below sentence adverbials. That means that even if we eliminate the possibly interfering factor of negation scoping over sentence adverbials, we get similar results for non-referential subjects. The data support Hypothesis 2-1 and thus again confirm the assumption that there is a topic position above sentence adverbials.

2.3 Experiment 3: Self-paced reading study

So far, we have only used an offline method, namely acceptability judgments, to test the assumed topic position in German. Both experiments showed a significant preference for non-referential subjects for the position below the sentence adverbial and for referential subjects for the position above the sentence adverbial.

Table 3: Mean reading times in ms for the critical region (the embedded clause without complementizer) in the four conditions (see Stolterfoht, Frazier & Clifton 2007: 367).

	referential	non-referential
SA-Su	2208	2277
Su-SA	2178	2555

As mentioned already, Stolterfoht, Frazier & Clifton (2007) tested materials analogous to the materials used in our Experiment 1 in a self-paced reading study. The examples were shown in (12) (repeated in (16)).

- (16) a. The father stated that/**certainly the son** washed the car.
 b. The father stated that/**the son certainly** washed the car.
 c. The father stated that/**certainly no son** washed the car.
 d. The father stated that/**no son certainly** washed the car.

Table 3 presents the reading times for the embedded clause (without the complementizer). Stolterfoht, Frazier & Clifton found a main effect of the factor POSITION, marginally significant in the subject analysis and significant in the item analysis, which fits well with the POSITION main effect of our Experiments 1 and 2: Reading times were faster when the subject was in its base position below the sentence adverbial.

Furthermore, there was a (marginally) significant interaction of the two factors. Comparing the condition containing non-referential subject and late adverb (16d) with each of the other conditions resulted in significant effects for all comparisons. Thus the comparison of the two non-referential conditions (16c) and (16d) revealed a significant difference. Since we also found significant differences for the referential conditions in our rating studies, we were interested in the comparison of the two referential conditions (16a) and (16b) of the data of Stolterfoht, Frazier & Clifton. An additional analysis revealed no significant difference ($F_s < 1.0$).

Thus, the question is whether similar results can be found for German using an online method. In Experiment 3, a self-paced reading study, we investigate the time course of position-dependent processing. Our assumption is that non-referential subjects have to stay in their base position and therefore are not able to move across sentence adverbials, which leads to a preference for the position below the sentence adverbial offline as well as online.

In contrast, referential subjects seem to be more flexible in the English study and are, from a syntactic point of view, potentially able to stay in their base position or move across sentence adverbials. If their behavior is the same in German, this would result in no reading time difference for this subject type. Thus the question is whether topicality, the factor which we assume is reflected in our offline data, influences online processing as well, or whether we find a similar pattern of results established by Stolterfoht's, Frazier's & Clifton's study.

If we look at position-dependent processing of adverbials, Störzer & Stolterfoht (2013) found discrepancies between online and offline data. They investigated sentences like (17) manipulating the position of frame adverbials such as *auf Mallorca* ('on Majorca') and *auf keiner Insel* ('on no island').

- (17) a. Eva meint, dass **wahrscheinlich auf Mallorca** alle Urlauber betrunken sind.
 Eva thinks that probably on Majorca all tourists drunk are
 'Eva thinks that probably on Majorca all tourists are drunk.'

- b. Eva meint, dass **auf Mallorca wahrscheinlich** alle Urlauber betrunken sind.
Eva thinks that on Majorca probably all tourists drunk are
'Eva thinks that on Majorca probably all tourists are drunk.'
- c. Eva meint, dass **wahrscheinlich auf keiner Insel** alle Urlauber betrunken sind.
Eva thinks that probably on no island all tourists drunk are
'Eva thinks that probably on no island all tourists are drunk.'
- d. Eva meint, dass **auf keiner Insel wahrscheinlich** alle Urlauber betrunken sind.
Eva thinks that on no island probably all tourists drunk are
'Eva thinks that on no island probably all tourists are drunk.'

In materials like (17), non-referential frame adverbials like *auf keiner Insel* ('on no island') showed a clear preference for the position below sentence adverbials both offline and online. In contrast, referential frame adverbials like *auf Mallorca* ('on Majorca') only showed a preference for the position above sentence adverbials in the offline experiment, but no difference online. The authors assume that referential frame adverbials are able to be topics,⁸ but that this information structural factor on sentence level is only considered in a later processing step – therefore effects only show up offline. Furthermore, there was a (marginally) significant main effect of POSITION in reading times for the position of frame adverbials below sentence adverbials.

Based on the results of Stolterfoht, Frazier & Clifton (2007) and Störzer & Stolterfoht (2013) and the results of our two rating studies, the following hypothesis can be formulated:

Hypothesis 3-1:

- In Experiments 1 and 2 we found a significant main effect of POSITION in favor of the base position of the subject below the sentence adverbial. Therefore, we expect this effect, in terms of shorter reading times, for Experiment 3 as well (this effect was also present in the online experiments by Stolterfoht, Frazier & Clifton 2007 and Störzer & Stolterfoht 2013).
- For referential vs. non-referential subjects, different patterns are expected: Since they are not able to move out of their base position, non-referential subjects are expected to show a preference for the position below the sentence adverbial. For referential subjects, which seem to be more flexible with regard to position, we predict no position-dependent preference. This prediction is also supported by the earlier results described above. Therefore, we should see an interaction of the factors SUBJECT TYPE and POSITION.

2.3.1 Method

2.3.1.1 Participants

36 undergraduate students of the University of Tübingen were paid for participation. All were native speakers of German.

2.3.1.2 Materials

Materials consisted of 24 experimental sentences (the same materials as in Experiment 2) and 48 filler sentences.

Filler sentences originated from two other studies. In the first ones, the position of temporal adverbials in relation to arguments was varied. The second ones varied the type of arguments (definite vs. indefinite).

⁸ Whether frame adverbials can serve as topics at all is still a matter of debate (see e.g. Chafe 1976; Jacobs 2001; Krifka 2008). A more detailed discussion of this matter can be found in Störzer & Stolterfoht (2013).

2.3.1.3 Design and procedure

The design was the same as in Experiment 2.

The experiment was run on a PC using E-Prime 2.0 software (Psychology Software Tools, Inc.). Sentences were segmented into five regions (Region 1: *Der Nachbar erwähnt*, ‘The neighbor mentions’; Region 2: *dass* ‘that’; Region 3: *tatsächlich der Junge* ‘actually the boy’; Region 4: *das Auto* ‘the car’; Region 5: *gewaschen hat*. ‘washed has’). They were presented using a self-paced reading task with a moving window technique, see (18).

(18) ---- -----, ---- ----- ---- ---- ---- ---- ----
 Der Nachbar erwähnt, ---- ----- ---- ---- ---- ---- ----
 ---- -----, **dass** ----- ---- ---- ---- ---- ---- ----
 ---- -----, ---- **tatsächlich der Junge** ---- ---- ---- ----
 ---- -----, ---- ----- ---- ---- **das Auto** ----- ----
 ---- -----, ---- ----- ---- ---- ---- ---- **gewaschen hat**.

Participants pressed the space bar to begin the trial, at which time a row of dashes appeared on the screen (each character of a sentence was represented by a dash). They were instructed to read the segments at their own pace. Pressing the space bar resulted in the presentation of the next region, while the previous region reverted to dashes. On 1/3 of the trials, participants had to answer a yes/no comprehension question by pressing one of two keys labelled “YES” and “NO”.

2.3.1.4 Data analysis

Participants’ reading times were analyzed for the five regions. A two-step procedure was used to eliminate outliers from the analysis: We first excluded reading times that were shorter than 50 ms for each region or longer than 4000 ms for Region 1, longer than 2000 ms for Region 2, longer than 5000 ms for Region 3, longer than 3000 ms for Region 4 and longer than 3500 ms for Region 5. In a second step, we excluded reading times that were more than 2.5 *SD* from the mean per participant and condition. This procedure led to overall less than 4% data loss for the particular regions (3.01% for Region 1; 2.08% for Region 2; 2.66% for Region 3; 2.43% for Region 4; 3.47% for Region 5). The remaining reading times were submitted to two separate ANOVAs for each region; one with an error term that was based on participant variability (*F1*) and the other with an error term that was based on item variability (*F2*).⁹

2.3.2 Results

No significant effects were found for the Regions 1 and 2, which were identical in all four conditions. Reading times for the critical Region 3 (consisting of the subject and the sentence adverbial) are presented in Table 4 and Figure 3.

Reading times in Region 3 exhibited a main effect of SUBJECT TYPE (*F1* (1,35) = 21.333, $p_1 < .001$; *F2* (1,23) = 8.265, $p_2 < .01$) as well as a main effect of POSITION (*F1* (1,35) = 10.909, $p_1 < .01$; *F2* (1,23) = 12.483, $p_2 < .01$), but no significant interaction of the two factors (*F1* (1,35) = 1.519, $p_1 = .226$; *F2* (1,23) = .751, $p_2 = .395$).

The Regions 4 and 5 showed a significant spill-over effect of SUBJECT TYPE in the subject analysis, but not in the item analysis (Region 4: *F1* (1,35) = 4.381, $p_1 < .05$;

⁹ Unfortunately, we could not determine the percentage of correct responses to the comprehension questions due to a technical error. But data of other self-paced reading studies from the same year showed that participants respond correctly for over 97% of comprehension questions.

Table 4: Mean reading times in ms for the critical Region 3 (sentence adverbial + subject) in the four conditions; standard deviation based on *F1* variability.

	referential	non-referential
SA-Su	658 (SD = 185)	718 (SD = 213)
Su-SA	699 (SD = 197)	793 (SD = 247)

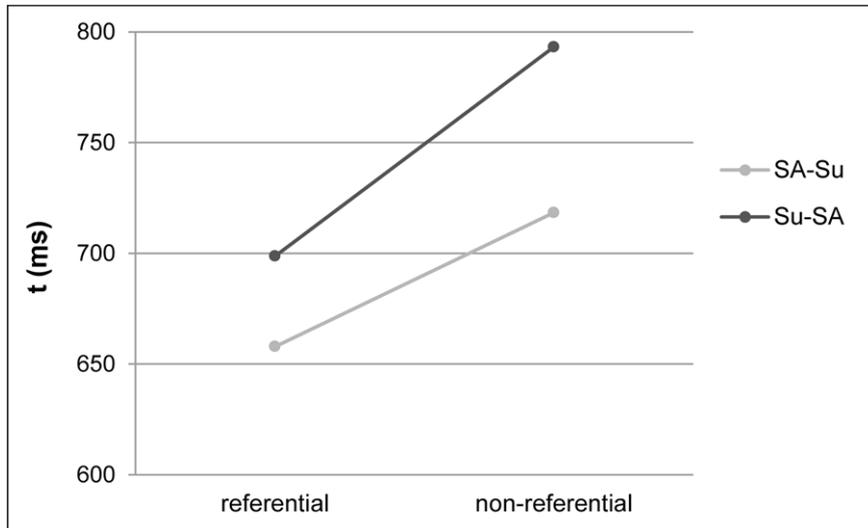


Figure 3: Mean reading times in ms for the critical Region 3 (sentence adverbial + subject) in the four conditions.

$F_2(1,23) = 1.965, p_2 = .174$; Region 5: $F_1(1,35) = 5.279, p_1 < .05$; $F_2(1,23) = 2.843, p_2 = .105$). No further effects were found in these regions.

2.3.3 Discussion of Experiment 3

Results revealed a significant main effect of POSITION. Such an effect could also be found in Experiments 1 and 2; it was predicted by Hypothesis 3-1 and reflects the subject’s base position below the sentence adverbial. In this reading time study, non-referential subjects like *jeder Junge* (‘every boy’) as well as referential subjects like *der Junge* (‘the boy’) were preferred in this position.

The interaction of the two factors SUBJECT TYPE and POSITION predicted by Hypothesis 3-1 could not be found. Since we made explicit predictions for single comparisons, we nevertheless calculated them: The comparison of the referential conditions yielded no significant difference ($F_1(1,35) = 2.274, p_1 = .141$; $F_2(1,23) = 2.231, p_2 = .149$), but there was a significant difference in reading times in the comparison of the non-referential conditions ($F_1(1,35) = 10.795, p_1 < .01$; $F_2(1,23) = 7.593, p_2 < .05$). Non-referential subjects show a preference for the position below the sentence adverbial. These results are predicted by Hypothesis 3-1. Furthermore, they fit well with the online results reported by Stolterfoht, Frazier & Clifton (2007), and with the results by Störzer & Stolterfoht (2013), who found a comparable discrepancy between online and offline data. Altogether, this suggests that non-referential subjects (and frame adverbials) are not able to move across sentence adverbials; they remain in their base position. By contrast, referential subjects (and frame adverbials) are more flexible and can appear in both positions. We assume that the influence of the factor topicality (manipulated on sentence level via referentiality) on processing is delayed, which then leads to a preference for the position above the sentence adverbial in judgments.

2.4 Experiment 4: Self-paced reading study with explicit topic marking

A possible objection against our preceding three experiments could be that these studies are not able to differentiate between the two factors referentiality and topicality. We interpreted the preference for referential subjects like *der Junge* ('the boy') in the position above the sentence adverbial as evidence for a topic position.

But how can we establish this claim and refute the objection that referentiality, not topicality is the crucial factor? To do this, we ran another self-paced reading study, in which we compared contextually topic-marked referential subjects with subjects that are not topic-marked. We claim that if topicality is the crucial factor at work, we should see processing consequences if this factor is determined contextually.

We used the two referential conditions of our materials (with the referential subject preceding or following the sentence adverbial). These two sentence types were preceded by two different types of context questions. One question marked the subject of the matrix clause as topic (like *Was erwähnt der Nachbar?* 'What does the neighbor mention?', see (19c) and (19d)), the other one marked the subject of the embedded clause as topic (like *Was ist mit dem Jungen?* 'What about the boy?' in (19a) and (19b)). This type of "What-about"-questions is commonly used in the literature to mark a certain phrase as an aboutness topic (see e.g. Maienborn 2003: 78; Frey 2007: 335).

Thus, sentence materials manipulated the two factors POSITION of the subject in relation to the sentence adverbial (preceding or following the sentence adverbial) and QUESTION TYPE (matrix subject question vs. embedded subject question); see the example in (19).

- (19) Was ist mit dem Jungen? –
'What about the boy?'
- a. Der Nachbar erwähnt, dass **tatsächlich der Junge** das Auto gewaschen hat.
the neighbor mentions that actually the boy the car washed has
'The neighbor mentions that actually the boy washed the car.'
 - b. Der Nachbar erwähnt, dass **der Junge tatsächlich** das Auto gewaschen hat.
the neighbor mentions that the boy actually the car washed has
'The neighbor mentions that actually the boy washed the car.'
- Was erwähnt der Nachbar? –
'What does the neighbor mention?'
- c. Der Nachbar erwähnt, dass **tatsächlich der Junge** das Auto gewaschen hat.
the neighbor mentions that actually the boy the car washed has
'The neighbor mentions that actually the boy washed the car.'
 - d. Der Nachbar erwähnt, dass **der Junge tatsächlich** das Auto gewaschen hat.
the neighbor mentions that the boy actually the car washed has
'The neighbor mentions that actually the boy washed the car.'

The following hypotheses can be formulated:

Hypothesis 4-1: Referentiality

If the referential status of the subject is responsible for the offline preference for the position above the sentence adverbial, we predict no difference dependent on the factor QUESTION TYPE.

Hypothesis 4-2: Topicality – immediate processing

If the topical status of the referential subject is responsible for the offline preference for the position above the sentence adverbial and if it is evaluated immediately, then...

- ...we predict shorter reading times for the order Su-SA compared to SA-Su with a preceding embedded subject question.

- ...we predict no difference for sentences preceded by a matrix subject question.
- This pattern should lead to an interaction of QUESTION TYPE \times POSITION.

Hypothesis 4-3: Topicality – delayed processing

If the evaluation of information structure is delayed, as in Experiment 3, we expect only a main effect of POSITION with shorter reading times for the order SA-Su.

2.4.1 Method

2.4.1.1 Participants

48 undergraduate students of the University of Tübingen were paid for participation. All were native speakers of German.

2.4.1.2 Materials

Materials consisted of 24 experimental sentences, which are the referential conditions of the Experiments 2 and 3, and 48 filler sentences. Each experimental item was prepared in four versions that differed with respect to the preceding question type (embedded subject question like *Was ist mit dem Jungen?* ‘What about the boy?’ vs. matrix subject question like *Was erwähnt der Nachbar?* ‘What does the neighbor mention?’) and the position of the subject (Su) relative to the sentence adverbial (SA) (SA-Su vs. Su-SA).

Filler sentences originated from two other studies. They were constructed as matrix sentences containing embedded sentences in which the position of different adverbials (manner and frame adverbials) in relation to arguments was varied.

2.4.1.3 Design and procedure

The experiment used a 2 (QUESTION TYPE: embedded subject question vs. matrix subject question) \times 2 (POSITION: SA-Su vs. Su-SA) design. Both factors were manipulated within participants and within items. Four presentation lists were constructed in which the 24 experimental items were randomly mixed with 48 filler sentences. The four lists were counterbalanced across items and conditions, so that each list included only one version of each experimental item.

The procedure was the same as in Experiment 3. The only difference was the presentation of the context question on the screen. Then the question disappeared and the appropriate critical sentence appeared on the screen. Target sentences were segmented into the same five regions as in Experiment 3 and were also presented using a self-paced reading task with a moving window technique, compare (18) in the description of Experiment 3. On 1/3 of the trials, participants had to answer a yes/no comprehension question by pressing one of two keys labelled “YES” and “NO”.

2.4.1.4 Data analysis

Data analysis was the same as in Experiment 3.

Excluded outliers were shorter than 50 ms for each region or longer than 4500 ms for Region 1 (*Der Nachbar erwähnt,*), longer than 2000 ms for Region 2 (*dass*), longer than 4000 ms for Region 3 (*tatsächlich der Junge*), longer than 2500 ms for Region 4 (*das Auto*) and longer than 4000 ms for Region 5 (*gewaschen hat*).

The overall data loss was less than 4% (2.86% for Region 1; 2.95% for Region 2; 2.34% for Region 3; 2.26% for Region 4; 3.39% for Region 5).

Participants answered the comprehension questions correctly in 97.66% of the cases.

2.4.2 Results

No significant effects were found for the Regions 1 and 2, except a main effect of QUESTION TYPE in Region 1 ($F_1(1,47) = 43.914$, $p_1 < .001$; $F_2(1,23) = 53.048$, $p_2 < .001$), with

shorter reading times for conditions with preceding matrix subject question compared to conditions with preceding embedded subject question.

For the critical Region 3 (consisting of the subject and the sentence adverbial), reading times are presented in Table 5 and Figure 4.

Reading times for Region 3 showed a main effect of QUESTION TYPE ($F_1(1,47) = 7.842, p_1 < .01; F_2(1,23) = 5.124, p_2 < .05$), but no main effect of POSITION ($F_1(1,47) = .551, p_1 = .461; F_2(1,23) = .152, p_2 = .701$). The interaction of the two factors was close to marginally significant, at least in the subject analysis ($F_1(1,47) = 2.755, p_1 = .104; F_2(1,23) = 2.519, p_2 = .126$).

Therefore, and since we made specific predictions for the two single comparisons, we analyzed planned comparisons separately. The comparison between the two conditions with preceding matrix subject question (18c) and (18d) yielded no significant effect ($F_1(1,47) = .428, p_1 = .516; F_2(1,23) = .080, p_2 = .780$). Equally, no effect could be found regarding the comparison between the two conditions with preceding embedded subject question, (18a) and (18b) ($F_1(1,47) = 2.549, p_1 = .117; F_2(1,23) = 1.620, p_2 = .216$).

But there was a significant difference in reading times in the comparison of the two conditions (18b) and (18d), with the order Su-SA ($F_1(1,47) = 12.648, p_1 < .001; F_2(1,23) = 8.231, p_2 < .01$) – sentences exhibiting this order were clearly read faster when preceded by an embedded subject question. In contrast, no such effect appeared in the comparison of (18a) and (18d), exhibiting the order SA-Su ($F_1(1,47) = .770, p_1 = .385; F_2(1,23) = .924, p_2 = .346$).

Region 4, which followed the critical region, showed a significant spill-over effect of QUESTION TYPE, significant in the subject analysis, and marginally significant in the item

Table 5: Mean reading times in ms for the critical Region 3 (sentence adverbial + subject) in the four conditions; standard deviation based on F_1 variability.

	matrix subject question	embedded subject question
SA-Su	729 (SD = 202)	704 (SD = 204)
Su-SA	739 (SD = 196)	670 (SD = 169)

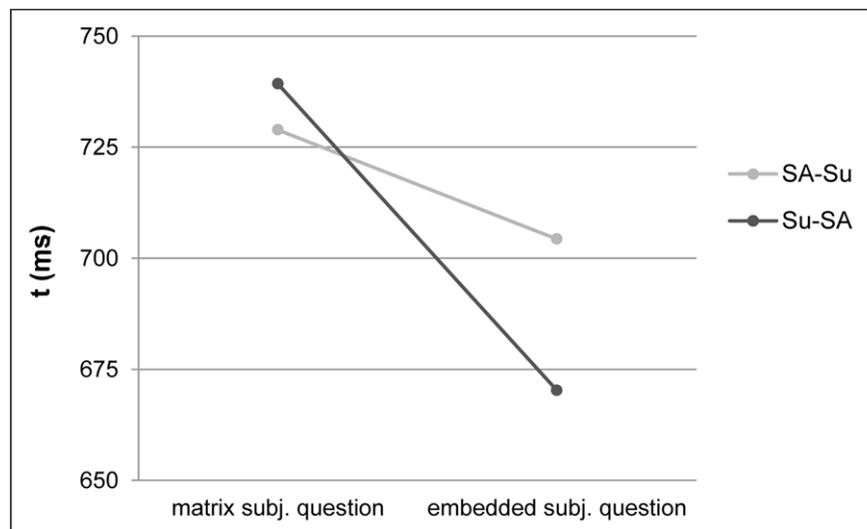


Figure 4: Mean reading times in ms for the critical Region 3 (sentence adverbial + subject) in the four conditions.

analysis ($F_1(1,47) = 4.935, p_1 < .05; F_2(1,23) = 4.037, p_2 = .056$). No further effects were found in this region and in Region 5.

2.4.3 Discussion of Experiment 4

The main effect of QUESTION TYPE in Regions 1 and 3 could be explained in terms of lexical repetition: We found shorter reading times for regions including repeated material compared to regions without lexical repetition. A second explanation for this effect in Region 1 could be topic shift: Longer reading times on Region 1 for the conditions preceded by the embedded subject question could be due to the fact that this region involves a topic shift from the DP *der Junge* ('the boy') in the question to the DP *der Nachbar* ('the neighbor') in the matrix clause in these two conditions – which is not the case in the two conditions with preceding embedded subject question.

In contrast to Experiment 3, we saw no overall preference for the subject below the sentence adverbial. This provides evidence against Hypothesis 4-3, according to which topical marking is processed with delay.

Reading time preferences for the critical Region 3 were different depending on QUESTION TYPE. The interaction of QUESTION TYPE and POSITION was at least close to marginally significant. If referentiality had been the crucial factor in Experiment 1 to 3, we should have seen a similar pattern of results, irrespective of the kind of preceding question. Therefore, Hypothesis 4-1 can be excluded. The results show that it is not only the referentiality of the subjects that leads to the offline preference for the position above the sentence adverbial.

By contrast, the QUESTION TYPE influences position-dependent processing. There was no significant difference between the two conditions with preceding matrix subject question (18c) vs. (18d), which was expected under Hypothesis 4-2. But there was also no statistically verifiable difference between the two conditions with preceding embedded subject question (18a) vs. (18b). According to Hypothesis 4-2, we would have expected a significant preference for the condition with the subject preceding the sentence adverbial. Nevertheless, the data show a reading time difference of about 35 ms for these two conditions. Sentences with the order Su-SA were read faster than sentences with the order SA-Su.

Regarding the planned comparisons according to the factor QUESTION TYPE, the reading time difference for the two conditions (18b) and (18d) with the order Su-SA, but different preceding question types, is significant. This order was read significantly faster with a preceding embedded subject question like *Was ist mit dem Jungen?* ('What about the boy?') than with a preceding matrix subject question like *Was erwähnt der Nachbar?* ('What does the neighbor mention?').

All in all, we interpret the results as evidence for Hypothesis 4-2. We conclude that it is not only the factor referentiality that makes referential subjects prefer the position above the sentence adverbial. The topical status of referential subjects affects their positioning preference as well – and is processed immediately.

3 Summary and general discussion

Overall, the results of all four experiments provide evidence for the existence of a (descriptive) topic position above sentence adverbials in German.

The results of Experiment 1, where we used definite referential subjects like *der Junge* ('the boy'), numerically quantified subjects like *zwei Jungen* ('two boys') and negated non-referential subjects like *kein Junge* ('no boy'), showed the predicted results. We found a preference for negated non-referential subjects in the position below sentence adverbials,

and a preference for definite referential subjects in the position above sentence adverbials; numerically quantified subjects revealed no significant position-dependent difference. These results confirm our assumptions with regard to (non-)topical properties of the three different subject types.

But the materials used in Experiment 1 contained a possible confounding factor that made the topic diagnostic using non-referential negated phrases proposed by Frey (2000; 2003), and also our results, less convincing. An alternative explanation for the effect found for negated subjects is that (modal) sentence adverbials cannot appear in the scope of negation (see e.g. Bellert 1977: 346; Lang 1979: 207; Piñón 2006: 1). To avoid this problem, we replaced the negated phrases by quantified non-referential subjects like *jeder Junge* ('every boy') in a second rating study and found the same pattern of results as in Experiment 1. We therefore conclude that non-referential subjects, independent of negation, are strongly preferred in their base position. We think that the reason for this is that they are not able to move across sentence adverbials. In contrast, subjects that are definite and referential (like *der Junge* 'the boy') are preferred in the position above sentence adverbials because they are prototypical candidates for aboutness topics.

In addition, we found a main effect of POSITION in both Experiment 1 and Experiment 2, suggesting that movement of the subject causes processing costs. With Experiment 3, we looked at the time course of position-dependent processing. The results of this study revealed a discrepancy between the online and the offline results. In contrast to Experiment 2, Experiment 3 did not show an interaction of the two factors SUBJECT TYPE and POSITION. But the main effect of POSITION leads to the same conclusion as for Experiments 1 and 2, namely that subjects are in general preferred in their assumed base position below sentence adverbials. A possible explanation for this offline vs. online discrepancy (also shown by Störzer & Stolterfoht 2013 for referential frame adverbials) would be that an information structural factor like topicality is considered in a second processing step and is therefore only reflected in offline but not in online processing data.

In order to distinguish between referentiality and topicality as a potential explanation for the offline preference for referential subjects in the position above sentence adverbials, we conducted Experiment 4, a further self-paced reading study, in which we marked the matrix or the embedded subject as an aboutness topic. The results showed that the order subject before sentence adverbial (Su-SA) was read significantly faster when the embedded subject was marked as topic by a preceding question, compared to when it was not topic-marked by a question. This leads to the conclusion that referentiality is not sufficient to explain the preference for referential subjects above sentence adverbials.

In sum, the experiments presented here provide evidence for the assumption that German has a designated position for topics above the base position of sentence adverbials in the German middle field – at least in a descriptive sense.

Furthermore, our data add experimental evidence to considerations with regard to (non-)topical noun phrases as proposed by e.g. Endriss (2009): We have shown that definite referential subjects are prototypical topics, that negated or quantified non-referential subjects are not, and that numerically quantified phrases can be used as topics as well as non-topics. In addition, the paper presents further evidence for the claim that an information structural factor like topicality (if not explicitly marked by a preceding context) is considered in a second processing step, and therefore can only be measured offline.

Additional File

The additional file for this article can be found as follows:

- **Appendices.** Sentence materials. DOI: <https://doi.org/10.5334/gjgl.122.s1>

Abbreviations

ACC = accusative, ANOVA = analysis of variance, DP = determiner phrase, GEN = genitive, IP = inflection phrase, SA = sentence adverbial, SD = standard deviation, Su = subject, TopP = topic phrase, VP = verb phrase

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Competing Interests

The authors have no competing interests to declare.

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